

REMARKS/ARGUMENTS

Claims 1, 5-8, 12-14 and 19-22 are pending in the instant application.

As amended above, claims 2-4 and 9-10 are canceled without disclaimer or prejudice to their subsequent reintroduction in this or a continuing application. The subject matter of claim 3 has been amended into claim 1. New independent claim 19 incorporates subject matter previously recited in claims 1 and 2. New independent claim 20 recites subject matter previously recited in claims 1 and 4. The subject matter of claim 10 has been amended into claim 8. New independent claim 21 incorporates subject matter previously recited in claims 8 and 9. New independent claim 22 incorporates subject matter previously recited in claims 8 and 11. No new matter has been added by these amendments. New claims 19-22 read on the elected invention. Claims 15-18, withdrawn from consideration pursuant to Examiner's Restriction Requirement and Applicant's Election, have been canceled without prejudice to their subsequent presentation in a divisional application. 35 U.S.C. § 121.

Claims 1-2 and 5-7 were rejected under 35 U.S.C. §§ 102(a), (e) as anticipated by U.S. Patent Publication No. 2002/0172838 by Rigney, *et al.* ("Rigney"). Reconsideration is requested.

Claim 1 has been amended to include elements of canceled claim 3. Claim 2 has been canceled.

Rigney was not alleged by the Office Action to teach or suggest the subject matter of claim 3, now incorporated into independent claim 1. Therefore, Applicant respectfully submits that the rejection of claims 1-2 and 5-7 as anticipated by Rigney has been overcome.

Claims 3 and 4 were rejected under 35 U.S.C. §103(a) as obvious of Rigney alone. Reconsideration is requested. Insofar as amended claim 1 incorporates the subject matter of claim 3, the Office Action avers that it would have been obvious for a person of ordinary skill in the art to modify the compound disclosed in Rigney of YSR having no more than 3 wt% yttria and a metal oxide equivalent of 7%-20% yttria by including between 6 and 8 wt% yttria, because Rigney discloses between 6 and 8 wt% yttria as the conventional prior art. Applicant respectfully disagrees. Rigney discloses at paragraph [0022] that "[T]he present invention makes use of very specific and limited amounts of [the disclosed alkaline-earth metal and rare-earth metal] oxides

in combination with only up to 3 wt% yttria, the effect of which is for the specific purpose of intentionally creating crystallographic defects that will suppress the thermal conductivity of YSZ TBC.” (emphasis supplied) It has been held that a prior art reference must be considered in its entirety, including portions that would lead away from the claimed invention. *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 U.S.P.Q. 303 (Fed. Cir. 1983). Therefore, Rigney does not suggest the modification proposed in the Office Action to arrive at the subject matter of claim 3, but rather specifically teaches against it. In view of the teachings of Rigney, one of ordinary skill in the art would be motivated against increasing the percentage of yttria in excess of 3 wt%, in combination with the disclosed metal oxides. Therefore, Applicant respectfully submits that the claims are patentable over the proposed modification of Rigney. Claim 4 has been canceled.

Claims 1-7 were rejected under 35 U.S.C. §103(a) as obvious over U.S. Patent Publication No. 2003/0059633 by Ackerman, *et al.* (“Ackerman”) in view of Rigney. Reconsideration is requested.

The Office Action admits that Ackerman fails to disclose a ceramic thermal barrier layer having a composition of between 3 and 15 mol% stabilizer and between 0.1 and 10 mol% lanthanum oxide. The Office Action relies upon Rigney, asserting that it teaches use of between 5.8 and 22.5 wt% lanthanum. However, as noted above with reference to the rejection of claim 1 over Rigney alone, Rigney does not teach the noted percentage of lanthanum in combination with yttria in excess of 3 wt%. Moreover, Rigney specifically teaches away from the use of lanthanum oxide in combination with yttria in excess of 3 wt%. Therefore, even presuming that one of ordinary skill in the art would be motivated to combine the two references, their combination does not suggest a ceramic thermal barrier layer as recited in independent claims 1, nor dependent claims 5-7.

Additionally, Ackerman discloses that a sintering inhibitor is located within gaps between columnar crystals on which YSZ is coated and it is diffused over the surface of the columnar crystals, as illustrated at Figure 4 and the accompanying description. According to Ackerman, the sintering inhibitor on the surface of the crystals suppresses an increase of heat conductivity and also suppresses sintering thereof. Although this inhibits an increase in heat conductivity

caused by sintering, this does not achieve a low initial heat conductivity throughout the material itself.

In contrast to Ackerman, when specific amounts of lanthanum oxide are added to the YSZ at a vapor deposition source, and then the coating is formed, the lanthanum exists not only on the surface but throughout the columnar crystals. As the examples in the present specification show, see p. 29, this composition achieves excellent low initial heat conductivity, as little as one third when compared to conventional YSZ. Any increase in heat conductivity following the initial stage is also prevented.

It has been held by the courts that to establish *prima facie* obviousness of a claimed invention, all of the claim limitations must be taught or suggested by the prior art *In re Royka*, 490 F.2d 981, 180 U.S.P.Q. 580 (CCPA 1974). Because the proposed combination of Ackerman and Rigney does not teach or suggest all recited claim features, Applicant respectfully submits that claims 1 and 5-7 are patentable over the two references, taken singly or in any combination.

Claims 8-14 were rejected under 35 U.S.C. §103(a) as obvious of Rigney in view of U.S. Patent No. 4,939,107 to Ketcham. Reconsideration is requested.

The Office Action again asserts that Rigney teaches the claimed combination of YSZ in a columnar grain structure with between 2 and 10 mol% lanthanum. However, as noted above in the argument as to claim 1, the embodiments disclosed in Rigney neither teach nor suggest the recited proportions of yttria and lanthanum. Specifically, Rigney teaches away from the use of lanthanum oxide with anything more than 3 wt% yttria. Therefore, the disclosed ranges of Rigney do not overlap the recited ranges in the present claims.

The Office Action relies on Ketcham only for its teaching of a zirconia-hafnia solid solution. However, even presuming that there is some teaching or suggestion to motivate one of ordinary skill in the art to combine the references as proposed in the Office Action, the addition of Ketcham does not ameliorate the deficiencies of Rigney with respect to underlying independent base claim 8. Therefore, Applicant respectfully submits that claims 8-14 are patentable over Rigney and Ketcham, taken singly or in any combination.

Claims 8-14 were rejected under 35 U.S.C. §103(a) as obvious over Ackerman in view of Rigney and further in view of Ketcham. Reconsideration is requested.

As noted above with respect to the proposed combination of Ackerman and Rigney alone in connection with claim 1-7, this assembled combination of three references fails to teach or suggest the recited proportions in independent claim 8. As noted above with respect to the proposed combination of Rigney and Ketcham in the discussion of claims 8-14, the addition of Ketcham does not offer any teaching or suggestion to ameliorate the deficiencies of Ackerman or Rigney with respect to underlying independent base claim 8. Therefore, Applicant respectfully submits that claims 8-14 are patentable over Ackerman, Rigney and Ketcham, taken singly or in any combination.

Claims 1 and 5-7 were rejected under 35 U.S.C. §103(a) as obvious over U.S. Patent No. 5,876,860 to Marijnissen, *et al.* (“Marijnissen”). Reconsideration is requested. The Office Action does not suggest that Marijnissen taken singly teaches or suggests the subject matter of claim 3, now recited in independent claim 1. Therefore, Applicant respectfully submits that this rejection has been overcome in view of the above amendments.

Claims 1-3 and 5-7 are rejected under 35 U.S.C. §103(a) as obvious over U.S. Patent No. 6,790,486 to Movchan, *et al.* (“Movchan”). Reconsideration is requested. The Office Action cites Movchan for its teaching of a ceramic thermal barrier layer including YSZ with a third metal oxide disclosed to be in one example to be between 10 and 20 wt% ceria. The Office Action avers that ceria is the functional equivalent of lanthanum, and that one of ordinary skill in the art would be motivated to substitute the latter for the former to arrive at the claimed invention. Applicant respectfully disagrees.

In contrast to claim 1, Movchan does not disclose the effects of lanthanum oxide, nor specific amounts of lanthanum oxide. Movchan is directed towards a new vapor deposition process. It does not teach or suggest the properties of a thermal barrier coating system including a ceramic material with the claimed proportion of lanthanum oxide recited in claim 1. Neither does it teach or suggest the effects of such a thermal barrier layer comprised of a plurality of columnar grains grown vertically from the surface of the metal substrate with an orientation in a direction of the <100> or <001> plane, having laminar or bar-shaped subgrains arranged on the surface on the columnar grains as recited in claim 20, or any equivalent structure.

Further, the chemical structure of ceria (CeO_2), as opposed to lantha (La_2O_3), argues

against their substitution. Ceria includes tetravalent Ce^{4+} . When present in the zirconia (ZrO_2), Ce substitutes for Zr, and the phase of the material can be stabilized by the effects of the larger ionic radius. Addition of CeO_2 does not cause an oxygen vacancy because a valency of the Ce is the same as that of Zr. In contrast both Y_2O_3 and La_2O_3 include trivalent elements. When present in a solid solution state with ZrO_2 , an oxygen vacancy is generated in order to maintain electrical neutrality in the presence of the oxygen vacancy to stabilize the tetragonal. Therefore, the mechanisms of phase stability between on the one hand CeO_2 and on the other hand La_2O_3 and Y_2O_3 are different. Therefore, the substitution proposed in the Office Action would not be obvious to one of ordinary skill in the art. Therefore, Applicants submits that claims 1 and 5-7 are patentable over Movchan.

Claim 4 is rejected under 35 U.S.C. §103(a) as obvious over Movchan as applied to claim 1, in view of Rigney. Claim 4 has been canceled.

Claims 8-10 and 12-15 are rejected under 35 U.S.C. §103(a) as obvious over Movchan in view of Ketcham. Reconsideration is requested. Claim 11 is rejected under 35 U.S.C. §103(a) as obvious over Movchan in view of Ketcham as applied to claim 8, and further in view of Rigney. Claims 9-11 have been canceled. As discussed above with reference to the rejection of claims 1-3 and 5-7 over Movchan, Movchan does not teach or suggest a ceramic thermal barrier layer having 0.1 to 10 mol% of lanthanum oxide as recited in independent claim 8. Further, as noted above with respect to claims 8-14, neither Rigney or Ketcham taken singly or in any combination offer any teaching or suggestion relative to the claimed composition including at least 3 to 15 mol% stabilizer in a zircon composition, and additionally 0.1 to 10 mol% of lanthanum oxide as recited in independent claim 8. Therefore, applicant respectfully submits that claims 8 and 12-15 are similarly patentable over Movchan, Rigney and Ketcham, taken singly or in any combination.

In light of the foregoing, Applicant respectfully submits that all claims are allowable. In the interest of brevity, Applicant has addressed only so much of the rejections as is considered sufficient to demonstrate that. Applicant's failure to address any portion of the rejections should not be construed as an acquiescence in the rejections.

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